NL/TARACORP SUPERFUND SITE GRANITE CITY, ILLINOIS

Prepared for

U.S. Environmental Protection Agency
Region V
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

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U.S. Department of the Army
Corps of Engineers, Omaha District
Omaha, Nebraska

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NL/TARACORP WASTE PILE INVESTIGATION

1.0 INTRODUCTION

At the request of the U.S. Army Corps of Engineers (USACE), Woodward-Clyde (W-C) prepared and implemented a work plan to collect representative samples from the NL/Taracorp waste pile for the purpose of analyzing for the following parameters:

- Total Organic Content
- Total BTU Value per pound
- Specific Density
- Total Lead Content

These analyses were completed using methodology specified in SW-846 and ASTM.

None of the previous investigations have included analyses to determine total organic content or total BTU value of the material contained in the waste pile. This information is required to evaluate the feasibility of a secondary smelting facility accepting the waste material as smelter feedstock. To be acceptable at a secondary smelting facility, the material must have a total BTU value of less than 5,000, and a total organic content of less than 500 ppm on an "as charged" basis.

Previous evaluations of the NL waste pile by OHM (1987 and 1994) and O'Brien & Gere (1988-1989) have resulted in a wide variation of estimates of the composition (25% to 50% slag) and average density (1.55 to 2.95 tons per cubic yard). The differences may be attributed to exploratory techniques, sample collection methods, and the heterogeneity of the pile due to historical changes in plant processes. This investigation has attempted to determine more accurate values for the waste pile material so that more accurate cost estimates can be included in the Second FS Addendum.

2.1 HISTORICAL RESEARCH / INTERVIEWS

Limited historical research and interviews of plant personnel were conducted to attempt to better determine what materials were deposited in various parts of the pile at different times. Current plant personnel were interviewed and to the extent possible historical records were searched. Available historical maps were reviewed to attempt to document activities related to the growth of the pile.

According to plant personnel, all of the materials contained in the pile were generated by on-site operations. It appears that the initial location of the waste pile was at the north end of the current pile, with the pile growing to the south over time. Most of the material was added to the top of the pile. The last area where material was added was at the southeast corner of the pile. It is not known if the pile extends below grade more than the 10 to 15 feet estimated from the trenches that W-C excavated in November, 1994. Plant personnel indicated that at no time did the public take material directly from the waste pile for use as fill. The hard rubber battery casing material that came out of the crusher associated with the battery breaking operation was reportedly dumped into bins at the end of the conveyor line. The fill material that the public had access to came from these bins.

The slag waste material that came out of the smelter actually consisted of two parts: the matte, the upper portion, was made up of the lead and iron froth; and the slag flux which was high in sand and limestone. This slag flux was re-fed into to the furnace and reused as flux. The slag matte, which probably comprised approximately 70 percent of the waste material, was dumped onto the pile.

Some of the drums of dross generated by the smelting operation and drums of bag house dust were disposed of onto the pile. The drums of dross were supposed to be recharged into the furnace, but some unknown number of these were disposed of onto the pile. Some of the drums have been removed and placed on the west side of the pile but it is not known if there are more in the pile. Plant personnel have also reported that there may have been some automotive scrap

materials brought in to the plant to be charged in the smelter, but there is no written documentation of this. No other materials are known to have been brought on site to be charged into the furnace or added to the pile.

Some of the material that would have gone onto the waste pile was removed by a licensed waste hauler and taken to the landfill located near the intersection of Interstate 70 and Illinois Route 203 south of Madison. This occurred while the property was owned by National Lead during the period of time when IEPA was restricting on-site disposal. On-site disposal of material onto the pile resumed when the plant was purchased by Taracorp in 1983, and continued until smelting operations were discontinued in late 1983.

Initially, the material that was incorporated into the pile was primarily slag from the smelting operations. When battery breaking operations were started on-site, the hard rubber battery casings, and later, plastic battery casings, were also added to the pile.

2.2 FIELD ACTIVITIES

Trenching and sampling of the Taracorp pile began on Monday, November 28, 1994. The purpose of the activities was to provide additional information to further evaluate possible remedial alternatives by:

- Collecting representative samples of the pile materials for chemical analysis.
- Collecting representative samples of the pile materials for physical properties analysis.
- Refining the estimates of the volume of the pile and each of its individual constituents.
- Evaluating the effectiveness of dust control methods through ambient air monitoring for total lead content.

2.2.1 Documentation

Documentation of the excavation activities consisted of daily entries in a field logbook, preparation of cross-sections of the excavations in the field (as-builts), photographs, and U.S. Army Corps of Engineers (USACE) Daily Quality Control Report (DQCR) forms. All documentation was prepared in accordance with SOP No. 5 of the Project Chemical Data Acquisition Plan (CDAP). All documentation will be added to the project file.

2.2.2 Excavation

WSI, Inc., was subcontracted by W-C to perform excavation of trenches into the Taracorp waste pile. Excavation was performed using a Komatsu PC300LC extended reach trackhoe. The total reach of the trackhoe was approximately 60 feet. Six trenches were excavated into the pile, with lengths ranging from 50 to 75 feet long (Figure 1). Depths varied from 15 to 30 feet depending on the location where the trench was excavated. Trenches near the south end of the pile tended to be deeper due to the pile being higher at that end. Trench widths were approximately 15 to 20 feet. Detailed logs of the excavation are included as Figures 2 through 7.

Materials within the trenches generally consisted of a 1 to 2 feet thick layer of battery casing material mixed with reddish-brown lead oxide dust overlying coarse slag material. This coarse slag material in turn tended to overlay slightly finer slag material mixed with clayey gravelly material. Other materials present in the pile included: dross (a white pasty material), metal scraps, cinders, mangled drums, bricks, and some wood. Natural soils underlying the pile tended to be gray-brown silty clays. The pile is estimated to extend approximately 5 to 10 feet below grade based on the results of the excavation activities. Cross sections of the individual trenches are included as Figures 2 through 7. Analytical results and density estimates of the individual components of the pile are included as Tables 1 and 2. Water appeared to be present as "perched" water within the pile and may have been present as a result of rainfall or as a result of the dust control measures. The water tended to enter the excavations once the excavation extended into the natural clays.

The materials within the trenches tended to be very unstable. Material collapses were a frequent problem. During the excavation of trench 5, the south wall of the excavation collapsed and

buried the trackhoe bucket and approximately 5 feet of the boom. Another trackhoe had to be brought on site to free the first trackhoe.

The trenches were backfilled with the excavated material following excavation of all the trenches. Backfilling was performed with a Caterpillar high-lift.

2.2.3 Sampling

Samples were collected from each of the trenches for chemical and physical property analysis. Two types of samples were collected from each trench: 1) representative composite samples with the mix of component materials based on a visual inspection of the trench, and 2) discrete samples of each of the major component materials identified. One composite was collected from each trench. Each composite sample consisted of a five (5) gallon bucket of material. Each five gallon bucket was weighed and an average density calculated. Each discrete sample consisted of sufficient material to perform the required analysis. Where stratification within a trench was noted, a discrete sample was collected from each strata. At least one discrete sample was taken from every trench and placed in a glass quart jar. The discrete samples were made up of one of the individual components of the pile. An attempt was made to obtain at least one discrete sample of every material in the pile excluding demolition type debris (i.e. wood, brick, and scrap metal).

2.2.4 Field Density measurements

Field measurements of the bulk density of the pile were also completed. Three dump truck loads of the excavated material (one from trench 3 and two from trench 4) were taken to the Taracorp truck scale and weighed for density comparisons. Prior to loading the truck, the truck bed was measured to provide a baseline volume estimate in cubic yards and the truck was weighed empty to obtain a tare weight in tons. After the truck was loaded it was inspected to determine an estimate of the volume of material compared to the total volume of the truck. The truck was then weighed and bulk density values for the material were calculated in tons/cubic yard. The first load of material was a mixture of all the materials from trench 3 and had a bulk density of 1.51 ton/cubic yard. The second load was mostly battery casing material from trench 4 and had a bulk density of 1.12 ton/cubic yard. The third load was of coarse slag material from trench 4 and had a bulk density of 1.80 ton/cubic yard.

In addition to these measurements, the composite samples from each trench were collected and weighed. Composite samples consisted of a five gallon bucket of representative material from each trench. Bulk densities were calculated for each of the composite samples. These bulk density values ranged from 0.83 tons/cubic yard to 1.41 tons/cubic yard. Results can be found in Table 2.

2.2.5 Personal Protective Equipment

All excavation and sampling activities were conducted in OSHA Level "C" personal protective equipment. All field activities, including decontamination, documentation and sampling were conducted in accordance with procedures specified in the Pre-Design Field Investigation Chemical Data Acquisition Plan and Site Safety and Health Plan.

OSHA Level "C" PPE consisted of:

- Hard hat
- Air purifying respirator (APR), full-face or half-face
- APR cartridges, High-Efficiency Dusts/Fumes/Mists Cartridge
- Coverall, Tyvek, no hood
- Undergloves, latex
- Outergloves, nitrile
- Boots, calf-high, Butyl Rubber, steel toed and shanked

Decontamination was conducted in a contamination reduction zone established adjacent to the pile. Decontamination procedures for PPE consisted of an Alconox soap wash, a potable water rinse, and a deionized water rinse. All decontamination fluids were disposed of onto the pile. Expendable materials having a low probability of contamination were collected and placed into trash bags and were put out for the municipal trash pickup. The trackhoes and high-lift were

decontaminated on the edge of the pile with the fire hose before leaving the site. Decontamination was performed in accordance with Standard Operating Procedure (SOP) No. 6 for the CDAP for the NL/Taracorp Superfund Site.

2.2.6 Analytical Procedures

For each discrete sample, the following analyses were conducted: for total lead by SW-846 Method 7420; for Total Organic Carbon (TOC) by EPA Method 415.1; for Solid Density by Method S.M. 2710F; and for BTU value by ASTM Method D240-76. All results are shown in Table 1. For the composite samples, each sample was weighed to determine the average density for that volume of material.

For the discrete samples, the results from each of the component materials were used in conjunction with the data from the visual inspection of the trenches. Values for TOC, BTU, and Solid Density were calculated for each trench based on the weighted percentages determined from the analysis of this data. Each sample was weighted to reflect the volume of material it represented.

Comparisons were made between the density results from the composite samples, discrete samples, and truckload densities. The differences noted can be considered to be a measure of the degree of uncertainty in the numbers.

3.0
DISCUSSION OF EXCAVATION ACTIVITIES AND FINDINGS

Six trenches, or approximately one every 100 feet, extending to the base of the pile were excavated. The trenches were located in various areas of the pile (**Figure 1**).

As shown in Tables 1 and 2, there was a significant variation in the results of the physical and analytical testing performed on samples of material collected from the individual trenches. Overall, total lead values ranged from 41,400 mg/kg to 154,000 mg/kg. This range is consistent with the results of previous investigations. Weighted averages of material densities for each trench were determined by using the solid densities calculated for the discrete samples and applying these to the material percentages estimated for each trench. These densities ranged from 1.41 tons/cubic yard to 2.18 tons/cubic yard, with an average density of 1.65 tons/cubic yard. This compares favorably with material bulk densities determined from truckloads of excavated material which had an average density of 1.50 tons/cubic yard.

However, it appears that the composite samples that were collected in five gallon buckets are not large enough to be representative, and tend to yield densities that are too low. The discrete sample weighted averages and the truckload densities appear to be a more accurate indication of the true range of densities of the material present in the pile.

Only three of eleven samples analyzed for BTU content yielded measurable BTU values (374, 700, and 9,820 BTUs/pound). These three samples consisted of predominantly battery casing material. TOC results ranged from 10,300 mg/kg to $>60,000$ mg/kg for the samples analyzed. Based on available information of the secondary smelting process, it appears that the TOC content of the slag could be due to the limestone and cast iron flux material used in the smelting process.

Specific details of each trench are discussed in the following sections.

3.1 Trench 1

Trench 1 was located near the north center of the pile with the long axis of the trench trending

north-south. The trench was approximately 75 feet long by 20 feet wide and 20 feet deep and extended about 10 to 12 feet below grade. Trench materials consisted of the hard plastic battery casing materials overlying coarse reddish-brown slag. This was underlain by a slightly finer slag overlying natural silty clays at about 10 feet below grade. One lens of red bricks and mortar approximately 20 feet long by 5 feet high was noted near the south end of the trench (**Figure 2**). No water was noted in the trench. One discrete sample was collected from the trench. The sample yielded a total lead concentration of 118,000 mg/kg, a density value of 1.49 tons/cubic yard, a Total Organic Carbon concentration of >60,000 mg/kg, and a BTU value of 9.820 BTU/pound.

3.2 Trench 2

Trench 2 was located at the northwest corner of the pile just south and east of the Taracorp office building and south of the employee parking lot. Its long axis trended east-west. The trench was approximately 50 feet long by 15 feet wide and 20 feet deep. It extended approximately 8 to 10 feet below the surface of the adjacent asphalt parking lot into natural silty clays. Trench materials were similar to those in trench 1 but with a high amount of the reddish-brown lead oxide dust (**Figure 3**). Because of the lead oxide dust, dust control at trench 2 was extremely difficult. Two discrete samples were taken from trench 2. Total lead values were 143,000 mg/kg in the battery casing material with the lead oxide dust and 41,400 mg/kg in the slag materials. Densities were 0.91 tons/cubic yard and 1.46 ton/cubic yard, respectively. Neither sample would ignite in the oxygen rich environment, so the samples had no measurable BTU values. TOC values were >60,000 mg/kg and 48,800 mg/kg respectively.

3.3 Trench 3

Trench 3 was located just north of the ramp onto the west side of the pile and had an east-west trend. The trench was approximately 60 feet long by 15 feet wide and 20 feet deep and extended approximately 8 feet below grade. Trench materials were similar to those described above (**Figure 4**). Two discrete samples were collected. One from the hard plastic battery casing material with the lead oxide dust and the second from the coarse slag material with clayey gravels. Total lead values were 154,000 mg/kg and 69,000 mg/kg respectively. Densities were 1.77 tons/cubic yard and 1.52 ton/cubic yard. The samples had no measurable BTU values. TOC values were 58,600 mg/kg and >60,000 mg/kg.

3.4 Trench 4

Trench 4 was located approximately 20 feet east of the small shed on the west side of the pile and had an east-west trend. The trench was approximately 60 feet long by 20 feet wide and 30 feet deep and extended approximately 15 feet below grade into the natural silty clays. Trench materials were similar to those described above but tended to be more randomly mixed together (Figure 5). Two discrete samples were collected. The first sample from the battery casing material with lead oxide dust had a total lead value of 99,000 mg/kg and a density of 1.52 ton/cubic yard. No measurable BTU data was obtained and TOC was 14,300 mg/kg. The second sample was from the slag materials with some clayey gravels and had a total lead value of 57,000 mg/kg, a density of 1.63 ton/cubic yard, and TOC of >60,000 mg/kg. The samples had no measurable BTU values. A thin layer of dross, a white, grainy, pasty substance that has been described as being the froth that came from the smelter kettles, was noted at about 15 feet in depth and extended from the center to the east end of the excavation.

3.5 Trench 5

Trench 5 had an east-west trend and was located near the south end of the pile on the west side. The trench was approximately 75 feet long by 20 feet wide and 30 feet deep and extended approximately 10 feet below grade into natural silty clays. Trench materials were similar to those described above (Figure 6). Due to excessive collapse of materials, the trench was extended to the east but was much shallower at that end. Water was noted entering the excavation where the excavation extended into the natural clays, apparently perched water within the pile. Three discrete samples were taken in trench 5. The first sample was from the battery casing material and had a total lead value of 62,900 mg/kg, a density of 1.88 ton/cubic yard, a BTU value of 374 BTU/pound and a TOC value of >60,000 mg/kg. The second sample was from the coarse slag material and had a total lead value of 59,600 mg/kg, a density of 1.98 ton/cubic yard, a BTU value of 700 BTU/pound and a TOC value of 38,900 mg/kg. The third sample came from a pocket of dross noted near the center of the excavation at a depth of about 25 feet. The sample had a total lead value of 55,100 mg/kg, a density of 1.36 ton/cubic yard, and a TOC value of 10,300 mg/kg. No measurable BTU values were obtained since the samples would not ignite in the oxygen rich environment.

3.6 Trench 6

Trench 6 was located at the southeast corner of the pile with its long axis trending northwest-southeast. The trench was approximately 50 feet long by 15 feet wide and 30 feet high and extended approximately 10 feet below grade into natural silty clays at the easternmost end. The trench materials consisted of a 1 to 2 feet thick layer of the battery casing material overlying the coarse slag material. A pocket of brick rubble was noted at the southeast end of the excavation (**Figure 7**). Water ponded at the east end where the excavation extended into the natural clays. One sample was collected from the coarse slag material in the excavation. The sample had a total lead value of 49,900 mg/kg, a density of 2.38 ton/cubic yard, and a TOC value of 20,200 mg/kg. The samples had no measurable BTU values. The trench was excavated approximately 5 feet into natural material at the southeast end of the trench. This portion of the excavation became filled with water that had an oily sheen on top.

4.0
TESTING OF DUST CONTROL MEASURES

The dust control plan for this investigation was effectively a pilot test for the potential removal or reconfiguration of the pile. The primary dust control measure to be utilized was wetting down of the excavation area. To monitor the effectiveness of the dust control measures, ambient air monitoring instrumentation was set up at four locations at the four corners of the waste pile (Figure 1). The instrumentation used consisted of four high volume air sampling stations. These monitors were set up to provide 24 hour averages for the determination of total lead in suspended particulate matter.

Dust control during excavation activities was accomplished using a one and one half inch diameter fire hose and spray nozzle attached to the Taracorp fire water system. Each trench location was saturated with water prior to excavation and soaked with a coarse spray during excavation. Any visible dust was sprayed in an attempt to keep it from spreading. Most of the visible dust appeared to be generated from the reddish-brown lead oxide that was associated with the overlying layer of hard plastic battery casing material. Once airborne, the dust proved resistant to the dust control measures utilized. What appeared to be lead oxide dust was noted floating on the ponded water that collected in the base of each trench.

Windy weather conditions made dust control very difficult. Due to the proximity of residential neighborhoods to the north of the pile, excavation on trench 2 was temporarily halted after dust control measures were unable to control the generation of visible dust and to keep it from blowing to the north. Excavation activities were moved to trench 6, at the south end of the pile, instead. Excavation of trench 2 was completed the following day when wind conditions permitted.

Dust levels were measured using Gilian Personal Air Sampling Pumps (PASPs), a MIE brand RAM, and four ambient air monitors stationed at the corners of the waste pile. The ambient air monitors ran continuously during the duration of the project and were shut off only to change the filters. The RAM was run daily during excavation activities only. The PASPs were worn by the W-C geologist and/or the trackhoe operator or laborer for the first five days of the project. The ambient air monitors and PASP filters were collected daily and analyzed for total

lead content. The ambient air filters were analyzed by IEA Laboratories in North Billerica, Massachusetts. The PASP filters were analyzed by Environmetrics Laboratory in Maryland Heights, Missouri. The RAM was attached to a strip chart recorder which provided data in the terms of relative dust levels but did not provide quantitative values. Results from the ambient air monitoring operation are included in **Table 3**.

The ambient air monitoring results indicated that on each day that excavation activities were conducted, at least one of the four ambient air monitoring stations measured total lead levels above the 1.5 ug/m^3 National Primary and Secondary (NNAAQS) ambient air quality standard for lead (**Table 3**). Results from samples collected on the day after excavation activities were completed were below the NAAQS standard.

The PASP air monitoring results for total lead ranged from 0.015 mg/m^3 to 0.053 mg/m^3. The OSHA eight hour time weighted average standard for worker exposure of 0.050 mg/m^3 was slightly exceeded on day three of the excavation activities (0.053 mg/m^3).

Based on the results of these excavation activities, it appears that future excavation activities will require more elaborate dust control measures than were utilized for this test project.

TABLES

TABLE 1: RESULTS OF ANALYTICAL AND PHYSICAL TESTING
NL/TARACORP WASTE PILE INVESTIGATION

SAMPLE	ANALYSIS					MATERIAL DESCRIPTION
	TOTAL LEAD (mg/kg)	SOLID DENSITY (g/ml)	SOLID DENSITY (tons/yd)	BTUs (BTU/lb)	TOC (mg/kg)	
TRENCH 1						
T1S1	118,000	1.76	1.49	9,820	>60,000	Battery Casing Material with Lead Oxide Dust
TRENCH 2						
T2S1	143,000	1.07	0.91	**	>60,000	Battery Casing Material with Lead Oxide Dust
T2S2	41,400	1.73	1.46	**	48,800	Slag Materials with some Clayey Gravel
TRENCH 3						
T3S1	154,000	2.09	1.77	**	58,600	Battery Casing Material with Lead Oxide Dust
T3S2	69,000	1.8	1.52	**	>60,000	Slag Materials with Clayey Gravel
TRENCH 4						
T4S1	99,000	1.8	1.52	**	14,300	Battery Casing Material with Lead Oxide Dust
T4S2	57,000	1.93	1.63	**	>60,000	Slag Materials with Clayey fine Gravel
TRENCH 5						
T5S1	62,900	2.22	1.88	374	>60,000	Battery Casing Material with Cindery fine Gravel
T5S2	59,600	2.34	1.98	700	38,900	Slag Materials with Clayey fine Gravel
T5S3	55,100	1.61	1.36	**	10,300	Dross
TRENCH 6						
T6S1	49,900	2.81	2.38	**	20,200	Slag with Battery Casing Material, fine gravel

** Sample would not ignite in an oxygen enriched environment

TABLE 2: DENSITY COMPARISONS

NL/TARACORP WASTE PILE INVESTIGATION

TRENCH	DISCRETE SAMPLE WEIGHTED AVERAGE (1) (tons/cubic yard)	COMPOSITE SAMPLE DENSITY (2) (tons/cubic yard)	BULK DENSITY (3) (tons/cubic yard)	MATERIAL DESCRIPTION
1	1.41	1.13		Slag with some Battery Casing Material (BCM), fine gravel
2	1.43	0.83		Slag with some gravel, BCM
3	1.51	0.86	1.51	Slag with some gravel, trace BCM, lead oxide dust, cinders, dross
4	1.49	0.88	1.12 1.80	BCM, lead oxide dust, cinders, dross, demolition debris Coarse slag with some gravel, trace BCM
5	1.9	0.68		Slag with some gravel, BCM, dross
6	2.18	1.41		Slag with trace BCM, gravels, demolition debris
Average Density	1.65	1.0	1.50	

(1) Density Calculations Based on Laboratory Data and Estimated Percentages of Various Materials in each Trench

(2) Density Calculations Based on a 5 Gallon Bucket of Representative Material from Each Trench (Loose Excavated Material)

(3) Density Calculations Based on Volume and Weight of Loaded Dump Trucks of Representative Material from Trenches 3 and 4

TABLE 3
AMBIENT AIR MONITORING DATA
NL/TARACORP SUPERFUND SITE

SAMPLE FILTER #	SAMPLE DATE	TOTAL SOLID PARTICULATE LEAD (ug/cubic meter)
10931-NE1	11/30/94	1.42
10952-NW1	11/30/94	1.96 (1)
10955-SE1	11/30/94	3.04 (1)
10928-SW1	11/30/94	5.56 (1)
10931-NE2	12/1/94	0.24
10952-SW2	12/1/94	9.91 (1)
10955-NW2	12/1/94	0.79
10928-SE2	12/1/94	0.18
10931-NE3	12/2/94	0.49
10952-SW3	12/2/94	18.15 (1)
10955-NW3	12/2/94	18.76 (1)
10928-SE3	12/2/94	0.37
10931-NE4	12/3/94	0.18 **
10952-SW4	12/3/94	13.89 (1)
10955-NW4	12/3/94	25.53 (1)
10928-SE4	12/3/94	0.18

TABLE 3
AMBIENT AIR MONITORING DATA
NL/TARACORP SUPERFUND SITE

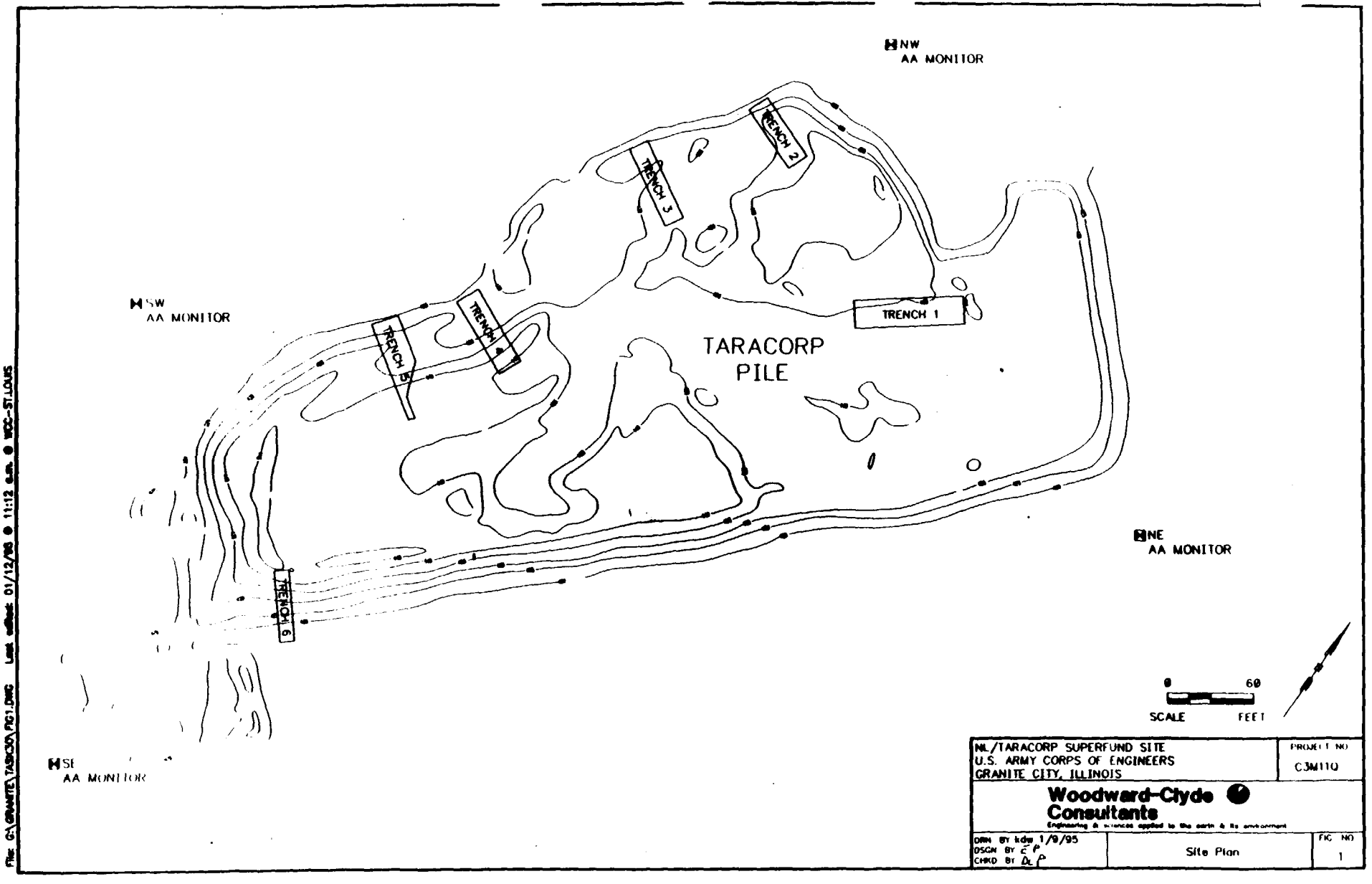
SAMPLE FILTER #	SAMPLE DATE	TOTAL SOLID PARTICULATE LEAD (ug/cubic meter)
10931-NE5	12/5/94	0.15
10952-SW5	12/5/94	0.09
10955-NW5	12/5/94	8.01 (1)
10928-SE5	12/5/94	0.06
10931-NE6	12/6/94	2.32 (1)
10952-SW6	12/6/94	0.59
10955-NW6	12/6/94	0.55
10928-SE6	12/6/94	0.37
10931-NE7	12/7/94	0.83
10952-SW7	12/7/94	0.6
10955-NW7	12/7/94	0.27
10928-SE7	12/7/94	0.14

* Indicates measurements which were not obtained.

** Indicates measurement is estimated.

(1) Concentration indicated is above the USEPA standard of 1.5 ug / cubic meter

FIGURES



NL/TARACORP SUPERFUND SITE
U.S. ARMY CORPS OF ENGINEERS
GRANITE CITY, ILLINOIS

PROJECT NO
C3M11Q

Woodward-Clyde Consultants
Engineering & sciences applied to the earth & its environment

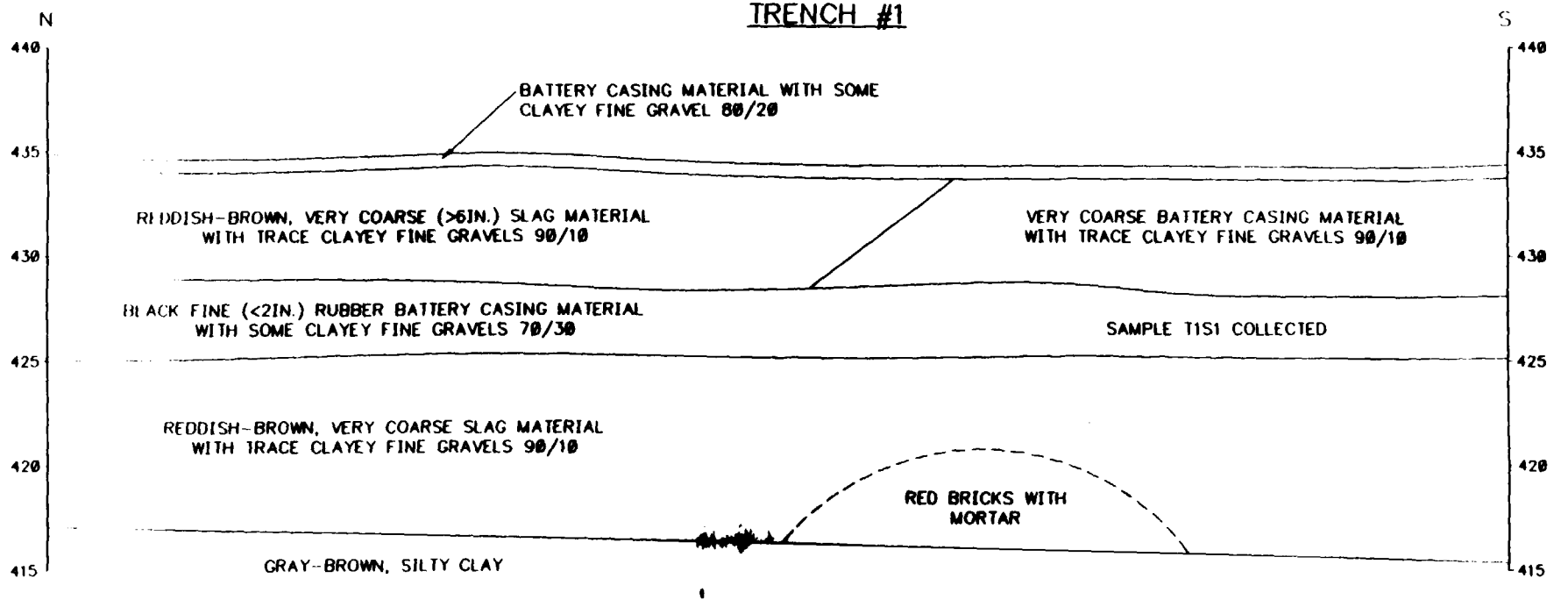
DRN BY kdw 1/9/95
DSGN BY CP
CHKD BY DLP

Site Plan

FIG NO
1

File: G:\GRANITE\TASKS\FIG1.DWG Last edited: 01/12/95 @ 11:12 a.m. @ WCC-ST.LOUIS

TRENCH #1

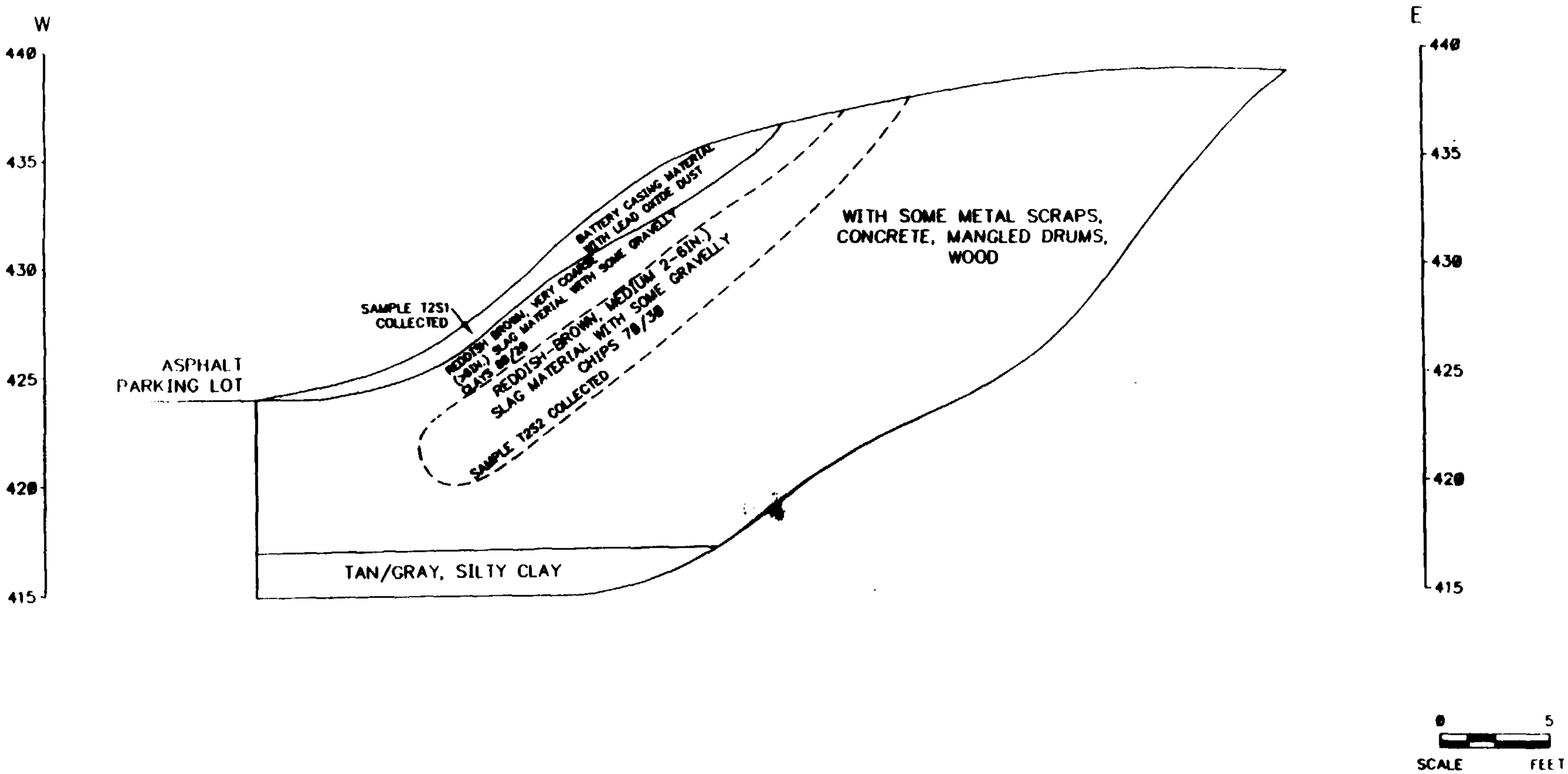


0 5
SCALE FEET

NOTE: Asphalt Parking Lot Elevation Approximate 424.0FT

NL/TARACORP SUPERFUND SITE U.S. ARMY CORPS OF ENGINEERS GRANITE CITY, ILLINOIS		PROJECT NO C3M110
Woodward-Clyde Consultants Engineering & science applied to the earth & its environment		
DRN BY: kdm 1/9/95 DSGN BY: EP CHKD BY: PVP	Cross Section Trench 1	FIG NO 2

TRENCH #2



NOTE: Asphalt Parking Lot Elevation Approximate 424.0FT

NL/TARACORP SUPERFUND SITE
U.S. ARMY CORPS OF ENGINEERS
GRANITE CITY, ILLINOIS

PROJECT NO: C3M11Q

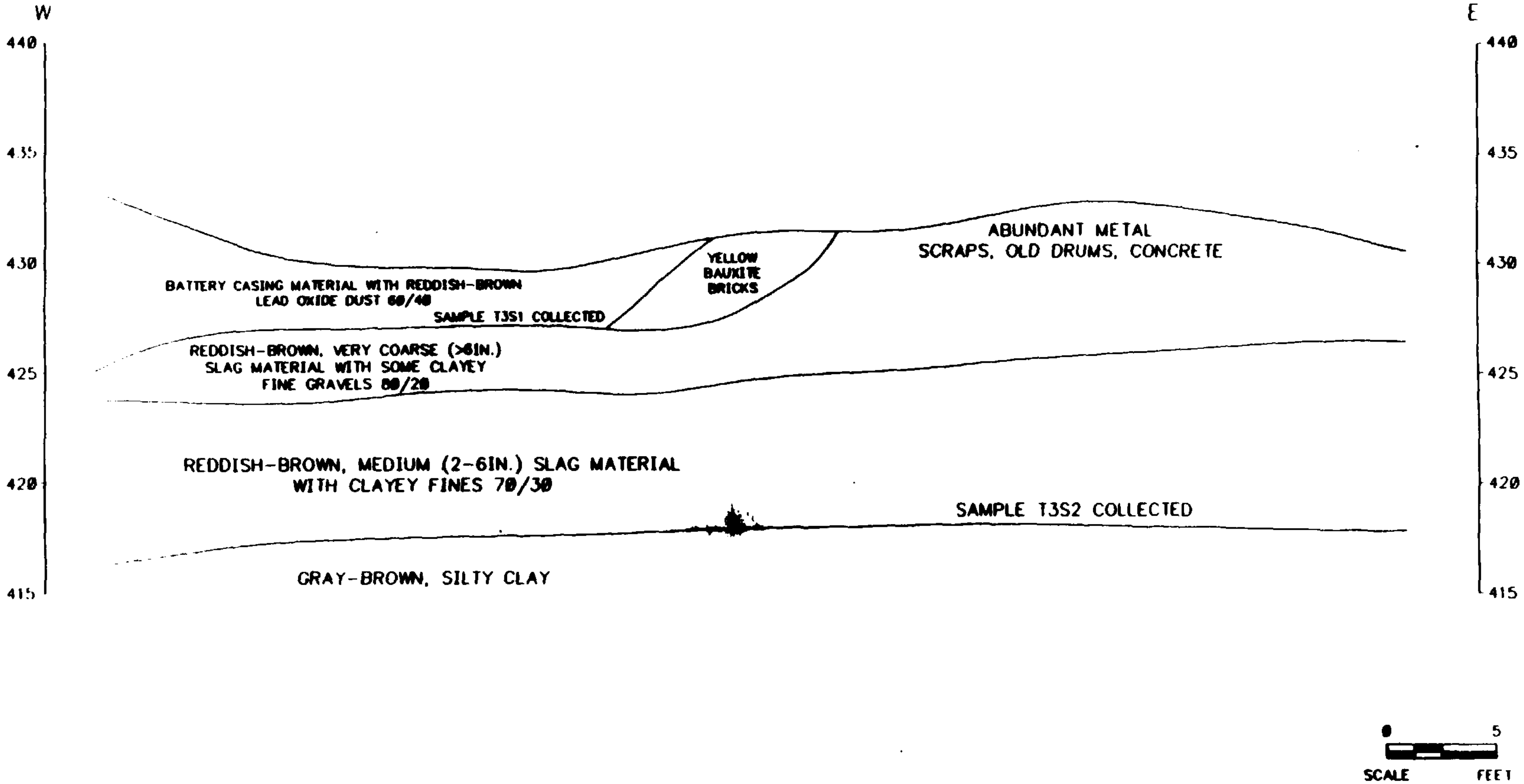
Woodward-Clyde Consultants

DRN BY: kdw 1/9/95
DSGN BY:
CHKD BY:

Cross Section Trench 2

FIG NO: 3

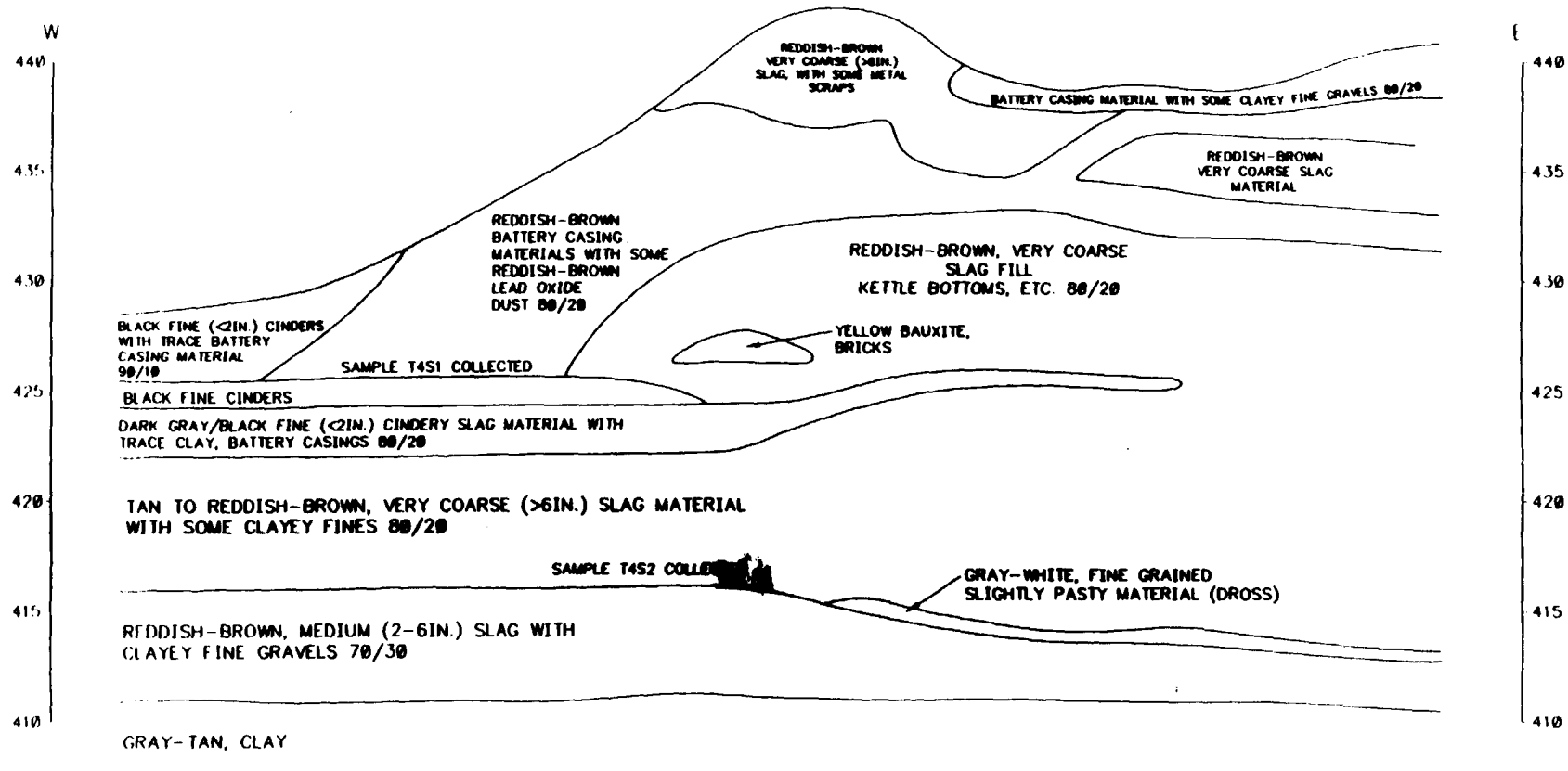
TRENCH #3



NOTE: Asphalt Parking Lot Elevation Approximate 424.0FT

NL/TARACORP SUPERFUND SITE U.S. ARMY CORPS OF ENGINEERS GRANITE CITY, ILLINOIS	PROJECT NO C3M11Q
Woodward-Clyde Consultants Engineering & sciences applied to the earth & its environment	
DRN BY: kdw 1/0/95 DSGN BY EP CHKD BY AXP	Cross Section Trench 3 — FIG NO 4

TRENCH #4

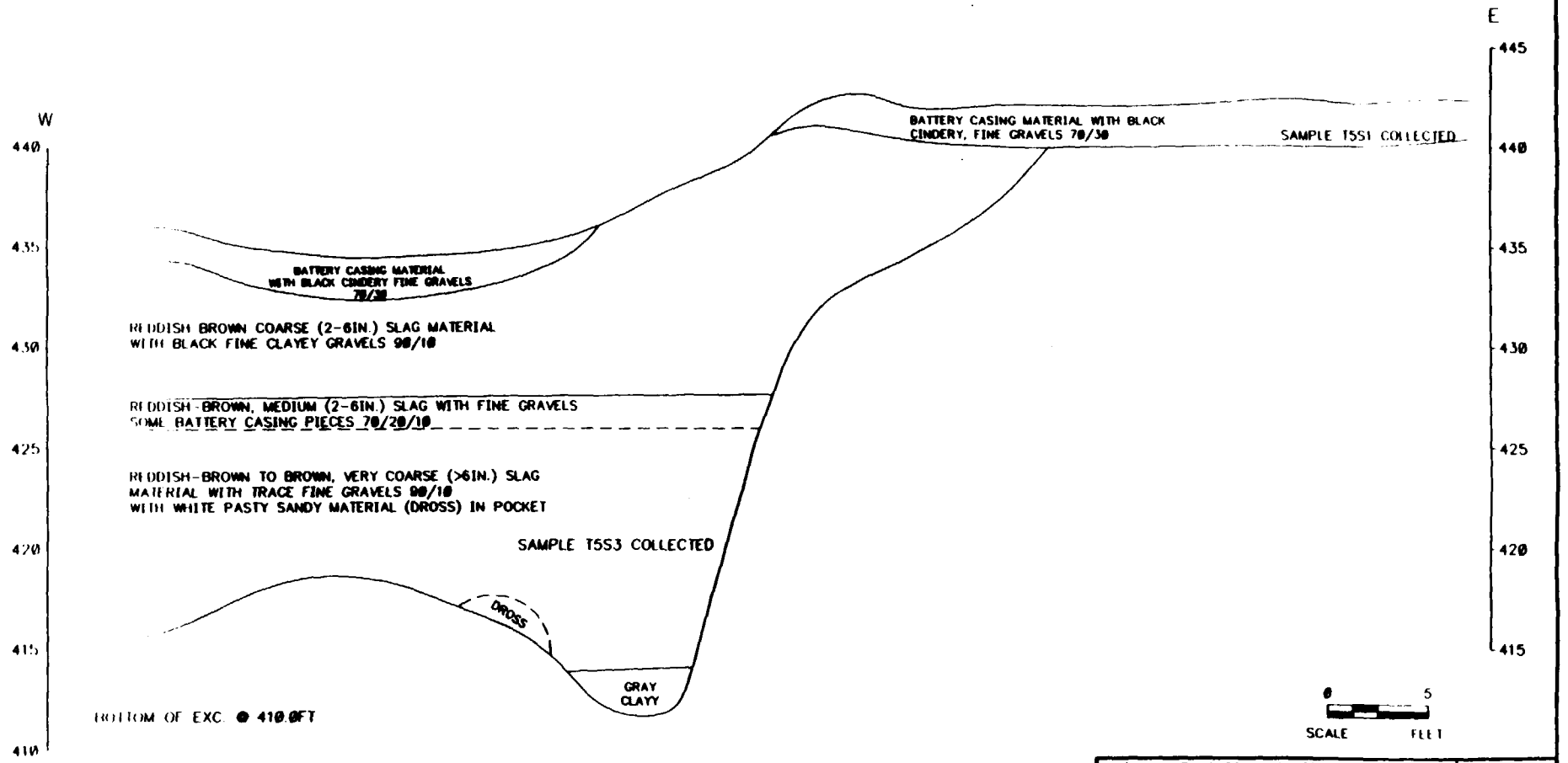


0 5
SCALE FEET

NOTE: Asphalt Parking Lot Elevation Approximate 424.0FT

NL/TARACORP SUPERFUND SITE U.S. ARMY CORPS OF ENGINEERS GRANITE CITY, ILLINOIS	PROJECT NO C3M11Q
Woodward-Clyde Consultants Engineering & sciences applied to the earth & its environment	
DRN BY kdw 1/9/95 DSGN BY EP CHKD BY LEP	Cross Section Trench 4
	FIG NO 5

TRENCH #5

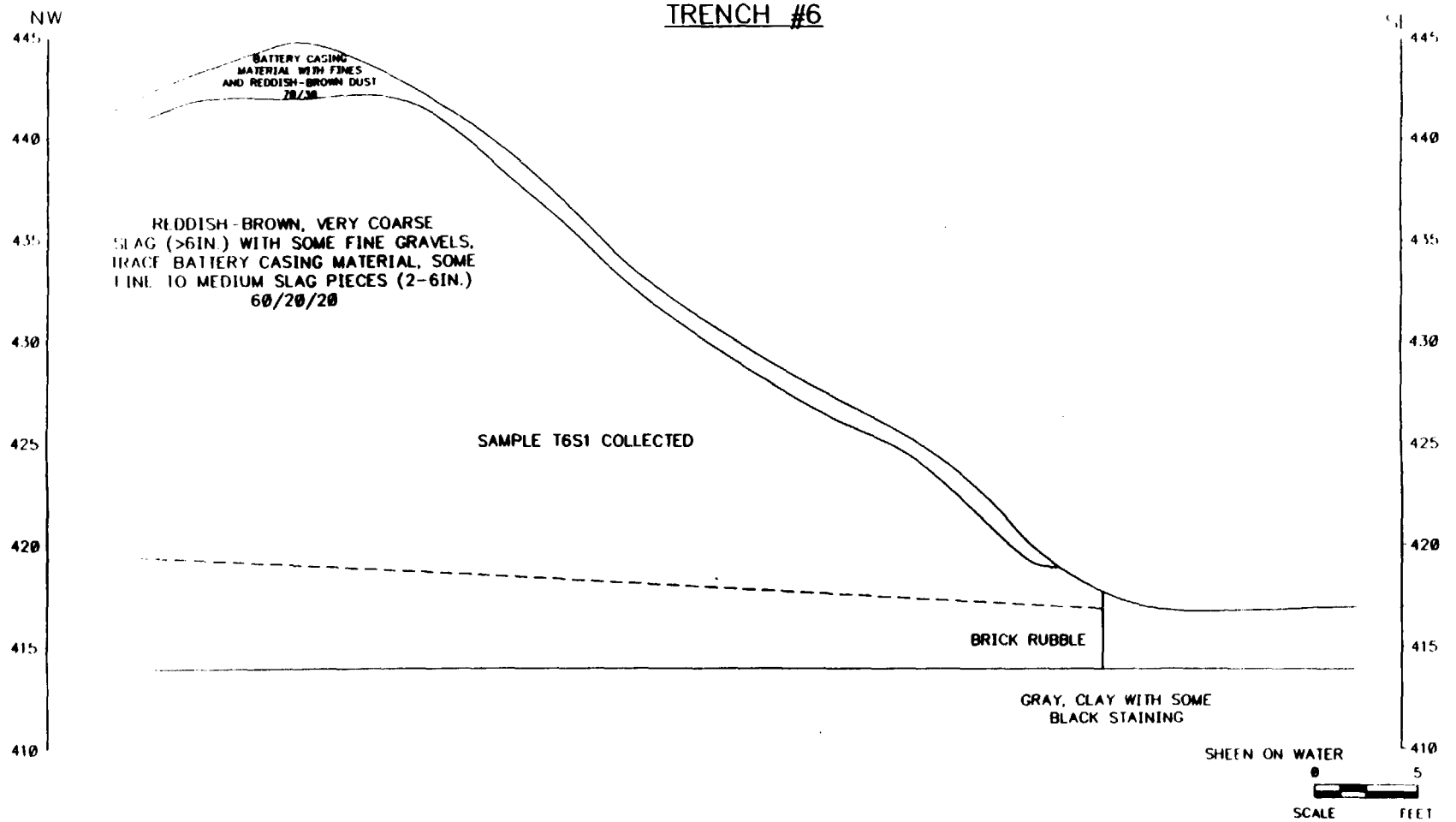


NOTE: Asphalt Parking Lot Elevation Approximate 424.0FT

NL/TARACORP SUPERFUND SITE U.S. ARMY CORPS OF ENGINEERS GRANITE CITY, ILLINOIS	PROJECT NO C3M11Q
Woodward-Clyde Consultants Engineering & sciences applied to the earth & its environment	
DRN BY: kdw 1/10/95 DSGN BY: SP CHKD BY: SP	Cross Section Trench 5
	FIG NO 6

File: G:\GRANITE\TASK30\FIG6.DWG Last edited: 01/11/95 @ 08:43 a.m. @ WCC-ST.LOUIS

TRENCH #6



NOTE: Asphalt Parking Lot Elevation Approximate 424.0FT

NL/TARACORP SUPERFUND SITE U.S. ARMY CORPS OF ENGINEERS GRANITE CITY, ILLINOIS	PROJECT NO C3M11Q
Woodward-Clyde Consultants Engineering & sciences applied to the earth & its environment	
DRN BY kdw 1/18/95 DSGN BY EP CHKD BY ASP	Cross Section Trench 6
	FIG NO 7

ATTACHMENT A

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DRIVE
MARYLAND HEIGHTS, MO 63043

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043-3529
(314) 427-0550

ATTN: DAVE PATE

INVOICE # 29774
PROJECT # C3M11Q-30, NL/TARACORP

PREPARATION BLANK
ICP/AA
(UNITS = mg/l)

PREP. CODE: MP-197-121
PREP. DATE: 11/09/94

ELEMENT	BLANK RESULT
LEAD	<0.100

LABORATORY CONTROL SAMPLE
ICP/AA
(UNITS = mg/l)

PREP. CODE: MP-197-121
PREP. DATE: 11/09/94

ELEMENT	VALUE	RESULT	PERCENT RECOVERY
LEAD	0.50	0.425	85

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043-3529
(314) 427-0550

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DRIVE
MARYLAND HEIGHTS, MO 63043

ATTN: DAVE PATE

INVOICE # 29774
PROJECT # C3M11Q-30, NL/TARACORP

ANALYSIS RESULTS

TOTAL LEAD
METHOD SW-846 7420

LAB NO.	IDENTIFICATION	RESULTS
9412303	T5-S1 11/29/94 16:00	62,900 mg/kg
9412304	T5-S2 11/29/94 16:01	59,600 mg/kg
9412305	T5-S3 11/29/94 16:02	55,100 mg/kg
9412306	T4-S1 12/01/94 13:00	99,000 mg/kg
9412307	T4-S2 12/01/94 13:01	57,000 mg/kg
9412308	T3-S1 12/01/94 14:30	154,000 mg/kg
9412309	T3-S2 12/01/94 14:31	69,000 mg/kg
9412310	T6-S1 12/02/94 15:30	49,900 mg/kg

DATE RECEIVED : 12/05/94 11:13
DATE ANLAYZED : 12/12 & 20/94
ANALYST : J.N., R.D.

DECEMBER 20, 1994

Wayne L. Cooper

WAYNE L. COOPER
LABORATORY DIRECTOR

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043-3529
(314) 427-0550

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DRIVE
MARYLAND HEIGHTS, MO 63043

ATTN: DAVE PATE

INVOICE # 29774
PROJECT # C3M11Q-30, NL/TARACORP

ANALYSIS RESULTS

DENSITY
METHOD S.M. 2710F

LAB NO.	IDENTIFICATION	RESULTS
9412303	T5-S1 11/29/94 16:00	2.22 g/ml
9412304	T5-S2 11/29/94 16:01	2.34 g/ml
9412305	T5-S3 11/29/94 16:02	1.61 g/ml
9412306	T4-S1 12/01/94 13:00	1.80 g/ml
9412307	T4-S2 12/01/94 13:01	1.93 g/ml
9412308	T3-S1 12/01/94 14:30	2.09 g/ml
9412309	T3-S2 12/01/94 14:31	1.80 g/ml
9412310	T6-S1 12/02/94 15:30	2.81 g/ml

S.M. = STANDARD METHODS, 17TH EDITION

DATE RECEIVED : 12/05/94 11:13
DATE ANLAYZED : 12/14 & 20/94
ANALYST : S.H.

DECEMBER 20, 1994

Wayne L. Cooper
RW

WAYNE L. COOPER
LABORATORY DIRECTOR

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043-3529
(314) 427-0550

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DRIVE
MARYLAND HEIGHTS, MO 63043

ATTN: DAVE PATE

INVOICE # 29774
PROJECT # C3M11Q-30, NL/TARACORP

ANALYSIS RESULTS

B T U
METHOD ASTM D240-76

LAB NO.	IDENTIFICATION	RESULTS
9412303	T5-S1 11/29/94 16:00	374/lb
9412304	T5-S2 11/29/94 16:01	700/lb
9412305	T5-S3 11/29/94 16:02	*
9412306	T4-S1 12/01/94 13:00	*
9412307	T4-S2 12/01/94 13:01	*
9412308	T3-S1 12/01/94 14:30	*
9412309	T3-S2 12/01/94 14:31	*
9412310	T6-S1 12/02/94 15:30	*

* = SAMPLE WOULD NOT IGNITE IN AN OXYGEN ENRICHED ENVIRONMENT.

DATE RECEIVED : 12/05/94 11:13
DATE ANLAYZED : 12/14 & 20/94
ANALYST : S.H.

DECEMBER 20, 1994

Wayne L. Cooper

WAYNE L. COOPER
LABORATORY DIRECTOR

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043-3529
(314) 427-0550

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DRIVE
MARYLAND HEIGHTS, MO 63043

ATTN: DAVE PATE

INVOICE # 29774
PROJECT # C3M11Q-30, NL/TARACORP

ANALYSIS RESULTS

TOTAL ORGANIC CARBON
METHOD EPA 415.2

LAB NO.	IDENTIFICATION	RESULTS
9412303	T5-S1 11/29/94 16:00	>60,000 mg/kg
9412304	T5-S2 11/29/94 16:01	38,900 mg/kg
9412305	T5-S3 11/29/94 16:02	10,300 mg/kg
9412306	T4-S1 12/01/94 13:00	14,300 mg/kg
9412307	T4-S2 12/01/94 13:01	>60,000 mg/kg
9412308	T3-S1 12/01/94 14:30	58,600 mg/kg
9412309	T3-S2 12/01/94 14:31	>60,000 mg/kg
9412310	T6-S1 12/02/94 15:30	20,200 mg/kg

DATE RECEIVED : 12/05/94 11:13
DATE ANLAYZED : 12/15/94
ANALYST : T.L.

DECEMBER 20, 1994

Wayne L. Cooper RW

WAYNE L. COOPER
LABORATORY DIRECTOR

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DRIVE
MARYLAND HEIGHTS, MO 63043

ATTN: DAVE PATE

INVOICE # 29774
PROJECT # C3M11Q-30, NL/TARACORP

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043-3529
(314) 427-0550

PREPARATION BLANK
ICP/AA
(UNITS = mg/l)

PREP. CODE: MP-197-34
PREP. DATE: 12/20/94

ELEMENT	BLANK RESULT
LEAD	<0.100

LABORATORY CONTROL SAMPLE
ICP/AA
(UNITS = mg/l)

PREP. CODE: MP-197-34
PREP. DATE: 12/20/94

ELEMENT	VALUE	RESULT	PERCENT RECOVERY
LEAD	0.50	0.46	92

Maryland Heights, MO 63043
(314) 427-0550

CUSTODY TRANS[illegible] RECORD/LABORATORY WORK R[illegible]UEST

COMPANY Woodward Clyde
ADDRESS 2318 Millpark Dr.
CITY/STATE/ZIP Maryland Hts MO 63043
PHONE ( )
CONTACT
DATE 12-5-94
DUE DATE 12-15-94
FAX
TURN AROUND TIME/INSTRUCTIONS: (Normal TAT)

COC [redacted]
PROPOSAL [redacted]
PROJECT [redacted]
PO [redacted]
PAGE [redacted] OF [redacted]

SAMPLE IDENTIFICATION

ITEM		SITE CODE/ SAMPLE DESCRIPTION	DATE COLLECTED	PRESERV.	CONTAINER	415.2/ TOC	BTU D240	Density	Total Pb 6010
1	[redacted]	T5-S1	11-29-94/1600	NA	Glass Qt	X	X	X	X
2	[redacted]	T5-S2	1600			X	X	X	X
3	[redacted]	T5-S3	1600			X	X	X	X
4	[redacted]	T4-S1	1300			X	X	X	X
5	[redacted]	T4-S2	1301			X	X	X	X
6	[redacted]	T3-S1	1400			X	X	X	X
7	[redacted]	T3-S2	1431			X	X	X	X
8	[redacted]	T6-S1	1550			X	X	X	X
9	[redacted]								
10	[redacted]								
11	[redacted]								
12	[redacted]								
13	[redacted]								
14	[redacted]								
15	[redacted]								

B4

12-5-94 11:13

ITEMS TRANSFERRED	RELINQUISHED BY	Date	Time	RECEIVED BY	Date	Time	REASON for TRANSFER
				[signature]	12-5	11:13	Transport
	K. Gkazycheski	12/6/94	0950	Karen M. Kimel	12/6	9:50	Storage
	[signature]	12/6	2:30	[signature] 0230	12/6	2:30	[illegible]
	[signature]	12/11	4:50	Cliff [signature]	12-11	4:50	Return

COMMENTS:

CHAIN OF CUSTODY RECORD

SHEET 1 of 1

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DR.
MARYLAND HEIGHTS, MISSOURI 63043
314-429-0100

PROJECT NO:	PROJECT NAME:
C3M110-30	NL / TARACORP

SAMPLER'S: (Signature) E. A. R.

DATE	TIME	SAMPLE I.D. NUMBER	NO. OF CONTAINERS	CONTAINER DESCRIPTION / ANALYSES REQUESTED: % SAT TOC	BTU	DENSITY	TOTAL LEAD		REMARKS
11/29	1600	T5-S1	1	X	X	X	X		Normal TAT
	1601	T5-S2	1	X	X	X	X		
	1602	T5-S3	1	X	X	X	X		
12/1	1300	T4-S1	1	X	X	X	X		
	1301	T4-S2	1	X	X	X	X		
	1430	T3-S1	1	X	X	X	X		
	1431	T3-S2	1	X	X	X	X		
12/2	1530	T6-S1	1	X	X	X	X		

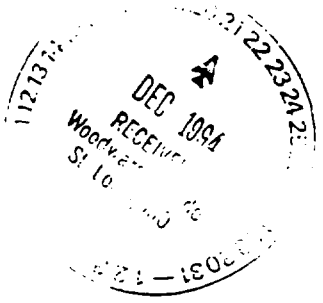
RELINQUISHED BY: (Signature)	DATE / TIME	RECEIVED BY: (Signature)	DATE / TIME
E. A. R.	12/2/94 1720	R. Gallagher	12/2/94 1720
RELINQUISHED BY: (Signature)	DATE / TIME	RECEIVED AT LAB BY: (Signature)	DATE / TIME
METHOD OF SHIPMENT:		AIRBILL NO:	

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043-3529
(314) 427-0550

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DRIVE
MARYLAND HEIGHTS, MO 63043

ATTN: ERIC PAGE

INVOICE # 29807
PO # PO94M-F-0024
PROJECT # C3M11Q/30



ANALYSIS RESULTS

SAMPLE ID: T2S1
LAB ID: 9412508
DATE COLLECTED: 12/03/94 1230
DATE RECEIVED: 12/07/94 0840

TEST PERFORMED	METHOD OF ANALYSIS	RESULTS		ANALYST
METALS ANALYSIS	SW-846 7420	TOTAL		
LEAD		143,000	mg/kg	12/08/94 R.D.
DENSITY	SM2710F	1.07	g/ml	12/16/94 E.A.
BTUs	ASTM D240-76	**	BTU/lb	12/19/94 T.L.
TOTAL ORGANIC CARBON	EPA 415.2	>60,000	mg/kg	12/19/94 T.L.

**Sample would not ignite in an oxygen enriched environment.

S.M.=STANDARD METHODS, 17TH EDITION

DECEMBER 20, 1994

Wayne L. Cooper

WAYNE L. COOPER
LABORATORY DIRECTOR

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043-3529
(314) 427-0550

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DRIVE
MARYLAND HEIGHTS, MO 63043

ATTN: ERIC PAGE

INVOICE # 29807
PO # PO94M-F-0024
PROJECT # C3M11Q/30

ANALYSIS RESULTS

SAMPLE ID: T2S2
LAB ID: 9412509
DATE COLLECTED: 12/03/94 1230
DATE RECEIVED: 12/07/94 0840

TEST PERFORMED	METHOD OF ANALYSIS	RESULTS		ANALYST	
METALS ANALYSIS	SW-846 7420	TOTAL			
LEAD		41,400	mg/kg	12/08/94	R.D.
DENSITY	SM2710F	1.73	g/ml	12/16/94	E.A.
BTUs	ASTM D240-76	**	BTU/lb	12/19/94	T.L.
TOTAL ORGANIC CARBON	EPA 415.2	48,800	mg/kg	12/19/94	T.L.

**Sample would not ignite in an oxygen enriched environment.

S.M.=STANDARD METHODS, 17TH EDITION

DECEMBER 20, 1994

Wayne L. Cooper

WAYNE L. COOPER
LABORATORY DIRECTOR

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043-3529
(314) 427-0550

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DRIVE
MARYLAND HEIGHTS, MO 63043

ATTN: ERIC PAGE

INVOICE # 29807
PO # PO94M-F-0024
PROJECT # C3M11Q/30

ANALYSIS RESULTS

SAMPLE ID: T1S1
LAB ID: 9412510
DATE COLLECTED: 12/03/94 1530
DATE RECEIVED: 12/07/94 0840

TEST PERFORMED	METHOD OF ANALYSIS	RESULTS		ANALYST	
METALS ANALYSIS	SW-846 7420	TOTAL			
LEAD		118,000	mg/kg	12/08/94	R.D.
DENSITY	SM2710F	1.76	g/ml	12/16/94	E.A.
BTUs	ASTM D240-76	9,820	BTU/lb	12/19/94	T.L.
TOTAL ORGANIC CARBON	EPA 415.2	>60,000	mg/kg	12/19/94	T.L.

S.M.=STANDARD METHODS, 17TH EDITION

DECEMBER 20, 1994

Wayne L. Cooper Ric

WAYNE L. COOPER
LABORATORY DIRECTOR

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DRIVE
MARYLAND HEIGHTS, MO 63043

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043-3529
(314) 427-0550

ATTN: ERIC PAGE

INVOICE # 29807
PO # PO94M-F-0024
PROJECT # C3M11Q/30

ANALYSIS RESULTS

PREPARATION BLANK

PREP CODE: MP.197.120
PREP DATE: 12/08/94

ELEMENT	BLANK RESULT
LEAD	<0.100 mg/l

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DRIVE
MARYLAND HEIGHTS, MO 63043

ATTN: ERIC PAGE

INVOICE # 29807
PO # PO94M-F-0024
PROJECT # C3M11Q/30

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043-3529
(314) 427-0550

LABORATORY CONTROL SAMPLE

(Units = mg/l)

PREP CODE: MP.197.120
PREP DATE: 12/08/94

ELEMENT	SPIKE AMOUNT	SAMPLE RESULT	%R
LEAD	0.50	0.51	102

CHAIN OF COUSTODY RECORD

SHEET 1 of 1

WOODWARD-CLYDE CONSULTANTS
2318 MILLPARK DR.
MARYLAND HEIGHTS, MISSOURI 63043
314-429-0100

PROJECT NO: C3M11Q-30

PROJECT NAME: NL / [illegible]

SAMPLER'S: (Signature) [signature]

CONTAINER DESCRIPTION / ANALYSES REQUESTED (24 Hour TAT)

DATE	TIME	SAMPLE I.D. NUMBER	NO. OF CONTAINERS	Filter Air Filter Total Pb	GT TAT TOC	BTU	Density	Total Pb	REMARKS
12/2/94	1600	Eric-4	1	(X)	~~X~~	~~X~~ OMIT	~~OMIT~~	X	Normal TAT
12/3/94	1230	TZS1	1		X	X	X	X	
↓	1230	TZS2	1		X	X	X	X	
↓	1530	T1S1	1		X	X	X	X	

RELINQUISHED BY: (Signature) [signature]	DATE / TIME 12/7/94 815	RECEIVED BY: (Signature) [signature]	DATE / TIME 12/7/94 0815
RELINQUISHED BY: (Signature)	DATE / TIME	RECEIVED AT LAB BY: (Signature)	DATE / TIME
METHOD OF SHIPMENT:		AIRBILL NO:	

ENVIRONMENTICS
2345 Millpark Drive
Maryland Heights, MO 63043
(314) 427-0550

CUSTODY TRANSFER RECORD/LABORATORY WORK REQUEST

COMPANY Woodward Clyde — CONTACT NOT GIVEN
ADDRESS 2318 Millpark Dr. — DATE 12/7/94
CITY/STATE/ZIP Maryland Heights MO — DUE DATE 12/19/94
PHONE ( ) — FAX ( )
TURN AROUND TIME/INSTRUCTIONS: NORMAL

[redacted]

SAMPLE IDENTIFICATION

ITEM	[redacted]	SITE CODE/ SAMPLE DESCRIPTION	DATE COLLECTED	PRESERV.	CONTAINER	TOC 415.2	BTU D240	Density SM2710F	Total Pb 6010
1	[redacted]	T2S1	12/3/94	4°C	1xG.Q.	X	X	X	X
2	[redacted]	T2S2	↓	↓	↓	X	X	X	X
3	[redacted]	T1S1	↓	↓	↓	X	X	X	X
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15						KC 12/7/94 0840			

Laboratory Blank

(B4)

ITEMS TRANSFERRED	RELINQUISHED BY	Date	Time	RECEIVED BY	Date	Time	REASON for TRANSFER	COMMENTS:
3				K. Hartsell	12/7/94	1840	Login	
	K. Hartsell	12/7/94	0920	C. Johnson	12/7	9:20	Initial	
	Chris Hickey	12/16/94	4:17	Cliff Dodson	12/16	417	Comp.	